Bulletin 406

CROPS FOR SOIL COVER AND IMPROVEMENT

Agricultural Extension Service, The Ohio State University

CROPS FOR SOIL COVER AND IMPROVEMENT

By

Lewis C. Saboe, *Extension Agronomist, O.S.U.*

and

Glen E. Bernath, *Management Agronomist, U.S.D.A., Soil Conservation Service, Defiance, Ohio*

Grasses and legumes used for soil cover and soil improvement have had a place in Ohio agriculture for some time. This publication is intended as a guide to those who are interested in growing any of these crops for either purpose.

The popularity of these practices has varied over the years. At present, due to greater specialization in farming, interest in cover crops is increasing. They are essential in a sound soil conservation program.

Grasses and legumes which usually occupy the land for less than a year and are used for soil cover and soil improvement will be considered. These crops are a source of organic matter, aid in the maintaining and improving of soil tilth, conserve soil moisture, reduce erosion, and conserve plant nutrients. In addition, properly inoculated legumes also have the ability to increase soil nitrogen.

Possible Benefits

Many benefits may be derived from the use of grasses and legumes for soil cover and soil improvement. These benefits will vary with the crop selected and its use in the cropping system.

Soil surface—The ground cover provided by these plants will reduce raindrop splash erosion and run-off, increase the infiltration of water, and prevent wind erosion especially on sandy or muck soil.

Within the soil—Production and incorporating of these plants will add organic matter, will improve the soil tilth, will minimize the leaching of plant nutrients, and will remove excess moisture. Properly inoculated legumes will also furnish a supply of nitrogen.

Farm Operations—A well established cover can be a help in the harvesting of corn in wet weather, can extend the time for making bulk application of fertilizer, and will lessen the need for excessive tillage.

Factors to be Considered

Will any of the "possible benefits" discussed in the previous section apply to your operation? Will these benefits be of sufficient value to warrant your investment of a little time and money? These are questions you should consider before making a decision.

With proper management, cover and soil improving crops will help to improve the physical condition and fertility of soils. If you are to include them in your cropping system, they must be given the same consideration in management as any other crop. Obtaining successful stands of these crops is a prime consideration in their adoption.

Selection of Crops

General

Drainage, either surface or internal, is not as critical in growing grasses as it is for legumes. A moderately acid soil is more satisfactory for the production of grasses than for legumes.

Under some circumstances the availability of high quality seed at a reasonable price may be the deciding factor in determining the crop to use.

Insect and disease conditions prevalent will also have a bearing on selecting the crop.

More details on most of these crops may be obtained from Extension Bulletin 380—*Meadow and Pasture Seedings.*

Seeding in Intertilled Crops

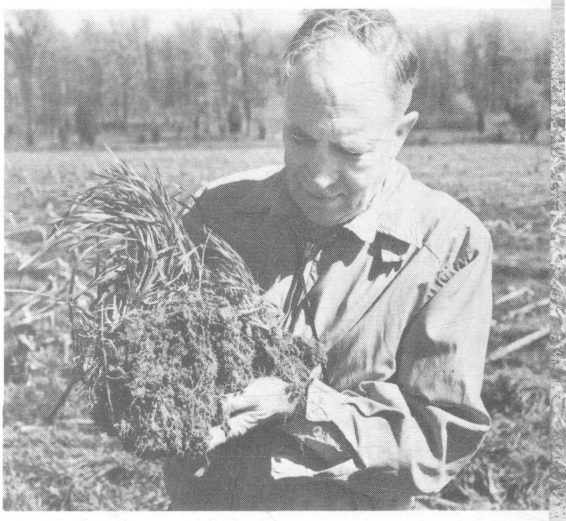
Research findings and practical experience both indicate that certain grasses and cereal rye are more satisfactory for use in intertilled crops than any of the legumes adapted to Ohio. Under some situations a grass-legume mixture may serve the purpose best.

Alta and Kentucky 31 fescues, field bromegrass and domestic (common) ryegrass all have extensive root systems, grow rapidly in the spring but generally do not develop rapidly enough during the seeding year to decrease the yields of the intertilled crops or interfere with harvesting operations.

Tall fescue seed germinates more slowly than the other grasses and makes less summer growth. Seed costs of tall fescue and field bromegrass are usually higher than ryegrass; however, the seed prices fluctuate greatly with supply and demand.

With extremely favorable growing conditions on high fertility soils, some farmers have had difficulty in combining soybeans where ryegrass was used as the interseeded crop. The disease, "Snow

Early spring growth of ryegrass that was broadcast seeded in corn.



Root development of field bromegrass in spring.

Spring growth of field bromegrass established by broadcast seeding at last cultivation of corn.

Mold," often reduces the stand of ryegrass during the winter. This seems most likely to occur if there is a lush growth of the grass going into the winter.

Cereal rye should not be seeded until late August or early September. It is the easiest cover crop to establish and about the only one that can be established on sandy or muck soil. Cereal rye has a much higher ratio of top to root than do the other grasses mentioned. It will produce very rank growth in the spring if plowing is delayed.

Seeding in Small Grain

Most seedings contain a legume either alone or in a mixture with a grass. Legume-grass mixtures have several advantages over either alone.

On many soils, grasses seeded with a legume protect the legume from heaving. Legume-grass mixtures keep out winter annual weeds better than pure stands of legumes. Legumes supply nitrogen to the grasses. Grasses grown with legumes contain a higher percentage of protein than grasses grown alone without supplemental nitrogen.

Legumes, in general, do not thrive on acid soils. Some legumes are more tolerant than others to this condition. Alfalfa and sweet clover both require a soil reaction of pH 6.5 or higher; red and ladino clover will tolerate a somewhat lower soil reaction. Good drainage is also essential for alfalfa production.

Among the various legume crops, biennial sweet clover is the most productive for soil improvement. It may be necessary to control the sweetclover weevil with insecticides in order to get a satisfactory stand. Medium red, mammoth, ladino, and alsike clovers with or without alfalfa can also be used. Alfalfa can not withstand heavy shading as well as red or alsike clovers. Therefore, red or alsike clovers will do better in wheat and winter barley, and alfalfa will usually do better when seeded in oats.

Timothy, tall fescue, or orchardgrass is often used in combination with legumes.

Seeding without a Companion Crop

The legumes and grasses discussed above may be established without a companion crop. In addition to these, cereal rye, sudangrass, hairy vetch, and soybeans are also often planted alone.

Quality Seed and Seedling Establishment

Seed Quality

A very important consideration in making a seeding of any type is the quality of the seed used. The seed of the crops used for cover and soil improvement are small and very difficult to evaluate. Seed sold in Ohio must be analyzed and labeled. Study the analysis tag attached to each bag of seed before purchasing. This tag will give the purity, germination and weed seed content if any. Many a farmer has established new and serious weeds on his farm through the purchase and use of inferior seed.

Very often the so-called "cheap" seed is the most expensive. It may be low in germination, contain noxious weed seeds, and it may not be the variety or type of seed desired. *HIGH QUALITY SEED DOES NOT COST—IT PAYS!* Be certain to get the class and quality of seed you want.

Seeding Problems

There is usually adequate rainfall in Ohio for successful seedling establishment. Seeding failures often do occur when there has been a light rain with enough moisture to permit the seed to germinate, followed by an extended dry period.

Interseeded crops are growing, occupying the land, and removing moisture and plant nutrients, at the same time as the regular field crop. Competition is mini-

mized by the selection of the proper crop and the date of seeding.

Seeding Methods

Broadcast seeders, grain drills, and airplanes have been used with varying degrees of success.

The broadcast type of seeder with a flat bottom and a good agitator is perhaps used most widely. When used in intertilled crops it is attached to the tractor with the cultivator and used at the same time. This eliminates an extra trip over the field. Seeding four rows at a time at cultivation or within a couple hours after cultivation before the soil settles is most satisfactory for broadcast seeding. The seed should be spread behind the cultivator. This works equally well in either corn or soybean fields. This type of seeder is also used when spring seedings are made in fall sown grains.

By removing the disk directly over the corn or soybean row you can use the grain drill to make seedings in intertilled crops. When seedings are made in spring sown small grains the grain drill with a band seeding attachment is most successful.

The use of the airplane for various types of seeding has been successful for many years. Recent refinements in the distribution systems used on these airplanes have resulted in more uniform distribution of seed. The use of the airplane makes it possible to seed at a later time in the year in both standing corn and soybeans. This has the advantage of a more favorable moisture situation, and there is less chance for the cover crop to interfere with harvesting or to compete with the growing crop. The chief disadvantage is that the soil surface is more or less compacted later in the season and does not provide as satisfactory a seedbed as immediately after cultivation.

Broadcast seeder used with cultivator in seeding grass cover crop.

Field bromegrass airplane seeded in tomatoes on August 15. Picture was taken in April.

Other types of seeders are available that may or may not be as satisfactory as the types mentioned above.

Suggested Seeding Rates

These suggested seeding rates will vary with the quality of the seed, the condition of the seedbed, and the seeding methods.

Common (Domestic) Ryegrass	15-20 pounds per acre
Kentucky 31 or Alta Fescue	15-20 pounds per acre
Field (annual) Bromegrass	10-15 pounds per acre
Cereal Rye	2 bushel per acre
Sudangrass	25 pounds per acre
Soybeans	2 bushels per acre
Hairy Vetch	15 pounds per acre
Alfalfa	8-10 pounds per acre
Clover, medium or mammoth	8-10 pounds per acre

Rates of seeding for grass in grass-legume mixture:

Orchardgrass	4-5 pounds per acre
Timothy	2-4 pounds per acre
Tall Fescue	5-6 pounds per acre

See Extension Bulletin 380—*Meadow and Pasture Seedings*—for more detailed discussion on seeding methods.

Management

Fertilizer

The application of fertilizer to both cover and soil improvement crops can be made as soon as the companion crop is removed, in early spring or just prior to turning the crop under. Early fall application will improve the crop itself and is advisable for well established stands. Late seeded crops may benefit more from early spring application. Late spring application will aid in the decomposition of the organic material and provide nutrients for the succeeding crop.

When the crop consists chiefly of grass or rye, nitrogen application at the time of plowing may be necessary. This nitrogen helps to decompose the residue plowed under and avoids temporary nitrogen deficiencies. Nitrogen deficiencies will more likely develop where top-growth is permitted to become excessive prior to plowdown.

Properly inoculated legumes grown for soil improvement will fix from a few to over 100 pounds of nitrogen per acre depending on crop and stand. Of the adapted legumes grown in Ohio biennial sweet clover, has the ability to fix the greatest amount of nitrogen.

(See Extension Bulletin 395, *Soil Fertility and Fertilizers for Ohio Farms,* for additional information.)

Summer and Fall Management

Clipping and removing the straw of small grains soon after combining improves the quality of the seeding established. Because of the growth habit of sweet clover, clipping is harmful to this plant. Sweet clover should not be clipped during the seeding year unless weeds threaten to destroy the crop. The clipping should then be made as high as possible and still check the weed growth.

Some soybean and corn harvesting equipment tends to concentrate the plant residue. If this is the case, the plant residue should be shredded and spread to avoid smothering of the growing crop.

Plowing-down the Growing Crop

In order to obtain the maximum benefit for soil improvement, let the crops get at least eight inches of top-growth before plowing them down. Moisture deficiencies should take priority over the amount of

top-growth in the determination of plow-down date. If not managed properly, such a crop may deplete soil moisture to such an extent that it will be detrimental to the following crop. They can be plowed down from early April until June 1.

Volunteer Stands

Volunteer stands of one crop in another are usually detrimental. Some common examples of these are: corn in soybeans, rye in wheat, and barley in oats.

Cover and soil improvement crops may also become detrimental in this respect if allowed to reseed. Because of this, great care should be taken in all phases of production of these crops to realize the major benefits without also producing these detrimental effects.

Present Status

In the northern third of Ohio there has been a decided increase in the use of cover crops during the past five years. Soil and climatic conditions in this portion of the state seem favorable for the summer establishment of cover crops.

Most of the farmers who have used cover crops are very enthusiastic about them. Many others are becoming interested.

Soil improvement crops have been in extensive use throughout the state for decades. One of the chief functions of these crops is the production of nitrogen. However, with commercial nitrogen becoming more readily available and at a lower unit cost many farmers have decided to purchase commercial nitrogen rather than produce it on the farm with a legume crop. This change has decreased the use of legumes to some extent.

Plowing ryegrass cover crop that was broadcast seeded in corn.

After soybean harvest the soil was disked lightly and rye was drilled at two bushels per acre. Picture was taken in April.

Tall fescue, late spring, established by broadcast seeding in corn at last cultivation.

Summary

Soil cover and soil improvement crops reduce erosion, provide additional organic matter, improve soil tilth, reduce the leaching of plant nutrients, remove excess soil moisture, and improve harvesting conditions.

Ryegrass, tall fescue, field bromegrass, cereal rye, sweet clover, alfalfa, and the true clovers all have been commonly used.

These crops can be seeded in companion crops of corn, soybeans, and small grain or can be seeded alone. Tractor broadcast seeders, grain drills, and airplane seeders have all been successfully used.

Care in seeding, along with adequate soil fertility, is essential for satisfactory seedling establishment.

Fertilizer applied to the growing crop will increase the amount of organic matter and will be available to subsequent crops. If soil moisture is adequate, the crop should be plowed down in the spring when about eight inches high.

Fall cover of ryegrass established by broadcast seeding at last cultivation.

Photos by Bernath, courtesy U. S. Soil Conservation Service

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